Biological Control of Water Hyacinth in the Sacramento/San Joaquin Delta

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Water hyacinth (*Eichhornia crassipes*) is a native of the Amazon River basin in tropical South America, but it has spread throughout much of the world and has come to be regarded as one of the worst aquatic weeds. It was introduced into the United States in 1884 as an ornamental plant, and by 1897, it was interfering with shipping in the waterways of the southeastern United States. The plant appeared in California in 1904. Infestations now occur in many natural and man-made waterways below 600 feet elevation in the Central Valley, San Francisco Bay, and the South Coast. The Sacramento/San Joaquin Delta supports heavy infestations of the weed.

In 2002, the CDFA entered into a contractual agreement with the Department of Boating and Waterways to determine the status of biological controls established in the Sacramento/San Joaquin Delta for control of water hyacinth. As part of this effort, a field survey was performed to determine the status and abundance of three biological control insects released in the 1980s. From the survey it appears that only the weevil *Neochetina bruchi* occurs in California, and that both the weevil, *Neochetina eichhorniae*, and the moth, *Sameodes albiguttalis*, failed to establish or are no longer present. In addition, *N. bruchi* was fairly common and abundant at certain times of the year. In 2003, a field study to determine the seasonal occurrence of the eggs, larvae, and adult stages of *N. bruchi* was initiated at two locations in the Sacramento/San Joaquin Delta: Whiskey Slough (San Joaquin County) and Rock Slough (Contra Costa County). A total of 10 adult plants and 10 daughter plants were sampled every two weeks from these locations. All plants were taken to the laboratory, examined for weevil adults and pupae, and then dissected for eggs and larvae. Sampling at Whiskey Slough began in September and at Rock Slough in October.

Whiskey Slough: Larval and adult weevil densities were very high at Whiskey Slough (Figure 1). Sampling in late summer showed that larval numbers were still very high, exceeding 16 larvae per plant in early September. Larval numbers steadily declined over the next six weeks but remained steady at approximately five larvae per plant through December. In contrast, adult numbers steadily increased from early September through mid October then appeared to level off during November and December, fluctuating between seven to 12 adults per plant. The number of weevil larvae and adults recorded in October through December at Whiskey Slough is much higher than published reports of weevil populations in other locations. Interestingly, plant mortality has been reported to occur at densities above five larvae per plant, yet no mortality appears to have occurred in plants at Whiskey Slough with larval densities three times higher. This lack of mortality associated with larval feeding will be further explored in 2004. Another interesting observation was the continued deposition of eggs by weevils despite the cold winter temperatures. It was commonly thought that because this insect is a tropical species with no diapause it would cease egg deposition once the temperatures dropped below 55^{o} F. At Whiskey Slough, however, egg deposition of *N. bruchi* has continued despite daytime temperatures below 55^{o}F in December and January.

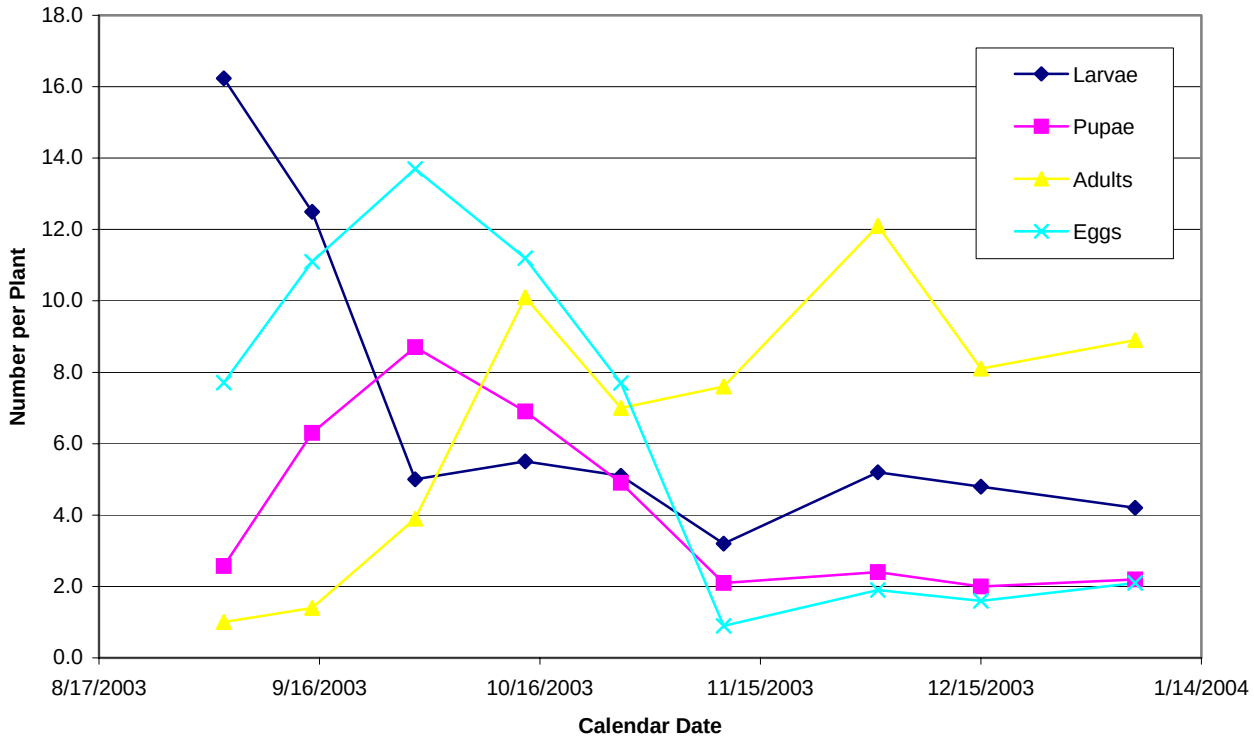

Figure 1. Larval and adult densities (numbers per plant) for the water hyacinth weevil *Neochetina bruchi* at Whiskey Slough in San Joaquin County, California, from September 3, 2003 to January 5, 2004.

Rock Slough: The weevil densities at Rock Slough were substantially lower than those observed at Whiskey Slough (Figure 2). Larval densities ranged between one and five larvae per plant and showed no clear increasing or decreasing trend. Pupal and adult densities at Rock Slough, however, were similar to those observed at Whiskey Slough with approximately one pupa and one adult per plant. The lack of change in adult numbers was similar to observations at Whiskey Slough for the same time period. Interestingly, egg deposition in November and December was higher at Rock Slough (one to four eggs per plant) than observed at Whiskey Slough (one to two eggs per plant) despite a higher number of weevils present at Whiskey Slough. Field monitoring at both the Whiskey Slough and Rock Slough sites will continue in 2004.

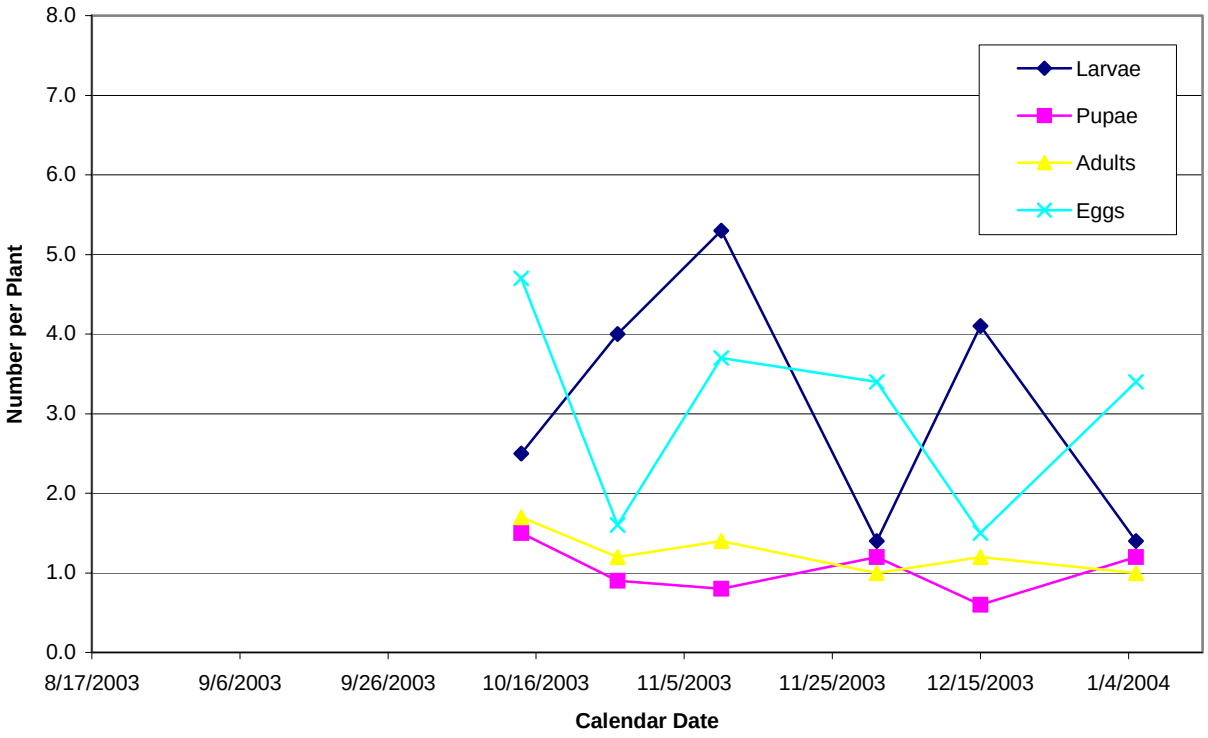

Figure 2. Larval and adult densities (numbers per plant) for the water hyacinth weevil *Neochetina bruchi* at Rock Slough in Contra Costa County, California, from October 14, 2003 to January 5, 2004.